4

Modeling of 1998 Hydrodynamics in the Delta

This chapter presents some results of the Section's effort to verify the DSM2 hydrodynamics model using 1998 hydrology. Simulation was made for the period January - September 1998. The processes involved in this effort are briefly discussed. Plots comparing model results with field data are presented for the ten Interagency Ecologic Program (IEP) monitoring stations described at the end of this chapter.

Consumptive Use

To run DSM2, an estimate of diversion and drainage flows (interaction between agricultural land and channels) is necessary. The Delta Island Consumptive Use (DICU) model provides this estimate. Input to the DICU model includes precipitation data, pan evaporation data and water year types. DICU hydrology data was extended to include precipitation data for the 1998 water year. Evapotranspiration adjustments were made for the 1998 water year using new monthly pan evaporation data. The FORTRAN code was updated to be compatible with new DSS pathnames in the current version of DSM2. The output dicu.dss file, generated after a series of DICU submodule runs, provides the estimate of Delta agricultural drainage and diversion flows for DSM2.

Boundary Conditions

Flow and stage information required at model boundaries was downloaded from the IEP web site *www.iep.water.ca.gov*. The boundary condition at Sacramento River was provided using flow information at Freeport because there is no monitoring station at the model boundary (Sacramento River at I street). Flow at Freeport is available in both daily and average formats. It was decided to use the daily averaged values because hourly data at Freeport, besides being incomplete, is likely to produce computed results that are not phase-synchronous with observed data at Freeport. Although the data downloaded were already in DSS format, there were a few technical difficulties that had to be worked out, some even before the data could be read, as described below:

1. Multiple sources of data

   The IEP database includes data collected by various agencies such as DWR and USGS. For some data several source agencies were available. DSM2 allows input from multiple sources, however, they must be assigned a priority order. As the first option DSM2 uses data ranked the highest priority, and then proceeds to those of lower priority, if necessary. Priority assigned was based on data availability and quality of the data as described below.

2. Quality assurance check of model simulations

a. Missing data

Input data, when visually examined using plotting routines, showed some data missing at certain times. These data were identified. In most cases alternate sources of data provided the missing data. For example, 15-minute (USGS) stage data at Martinez were labeled as missing for the months of February and May. After consultation with Karl Jacobs of DWR's Environmental Services Office, the hourly real-time data (source: DWR California Data Exchange Center) which is considered 'raw', was used for those periods.

b. Questionable data

Field data for all rim-flows and the stage at Martinez were closely examined for each month to ensure that no bad data were used. Unusual spikes seen with some data items suggested errors in the measurements, possibly due to an equipment malfunction. Except for Martinez data, use of alternate sources of data eliminated the problems. It was found that seven Martinez stage data points had to be rejected for the period between January 18 and April 13. Fortunately, it was easy to come up with a reasonable estimate of the correct values for the data points through linear interpolation.

c. Quality assurance check of model output

Once the technical issues described above were resolved, model simulations were completed for the nine-month period. Each plot of flow data was carefully examined to ensure that all input data were correctly entered in the model. In some channels model response was questionable during the May 28 to June 2 period. Upon closer inspection, it was discovered that at Martinez boundary stage information was missing during two separate intervals of time: 12 data points between May 27 at 10 p.m. and May 28 at 9 a.m., and 13 data points on May 31 between 6 a.m. and 6 p.m. These were most likely interpreted as zero by the model, resulting in absence of tidal fluctuations for this time interval. Because the model response is very sensitive to the changes in the Martinez stage, it was decided to leave the data unadjusted. Consequently, <u>the results between May 28 and June 2 should be disregarded</u>.

Comparison with Field Data

Comparisons of computed flows were made with field data at ten Interagency Ecologic Program monitoring stations (Figures 4-1 through 4-30). The plots at each location are shown for three time periods, selected to represent various hydrology conditions, as allowed by data availability. The degree of agreement between observed and computed flows varies depending on the locations, and sometimes on the periods, as described below.

For Sacramento River at Rio Vista, the agreement between the field data and the computed flows is very good, especially for the months of March and June as shown in Figures 4-2 and 4-3. Among other locations, San Joaquin River at Jersey Point (Figures 4-7 through 4-9), Old River at Rock Slough (Figures 4-10 through 4-12) and Middle River at Bacon Island (Figures 4-13 through 4-15) exhibit a very good match between model results and field data. At Three Mile Slough the model closely agrees with field data for the months of May and August (Figures 4-17 and 4-18), but less so for February (Figure 4-16). At Sacramento River below Georgiana Slough, tidal fluctuations in flow are much higher in the model than shown by the field data (Figures 4-19 through 4-21). At San Joaquin River at Highway 4, model flows are consistently lower compared to field data in the seaward direction and higher compared to field data in the landward direction indicating more tidal influence in computed flows (Figures 4-22 through 4-24). Dutch Slough shows an excellent match between model and field data (Figures 4-25 through 4-27) except for the time around May 28 and 31 because of missing input data, as explained in the last section.

At Sacramento River upstream of the Delta Cross Channel, model estimation of flows is much lower than field data (Figures 4-4 and 4-5). When the Delta Cross Channel gates are closed, a higher tidal influence is observed in model results, as shown by much lower flows compared to the observed data (Figure 4-6). The comparison looks much better when the cross channel gates are open, as observed for the period beginning July 17, 1998. Figures 4-28 through 4-30 show that in the Sacramento River at Freeport, fluctuations in flow are more pronounced in the model results when compared to the field data. This could be attributed to the approximation of boundary condition data described earlier.

[Editor's Note: Electronic copies of all the figures for this chapter could not be found, thus the figures are not included in this reprinting of this report. MDM, 2001.09.11]